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The initial question in the title is answered through simple experiments for culturally disadvantaged children in elementary school. Muscles, running, water, wind, steam, fast burning and electricity are found to "make things go." Using these basic discoveries, vocabulary is built up by working with different words relating to the experiments. A story is told in terms familiar to the culturally deprived children. The boy in the story makes the discoveries shown in the experiments as he plays with Christmas toys.

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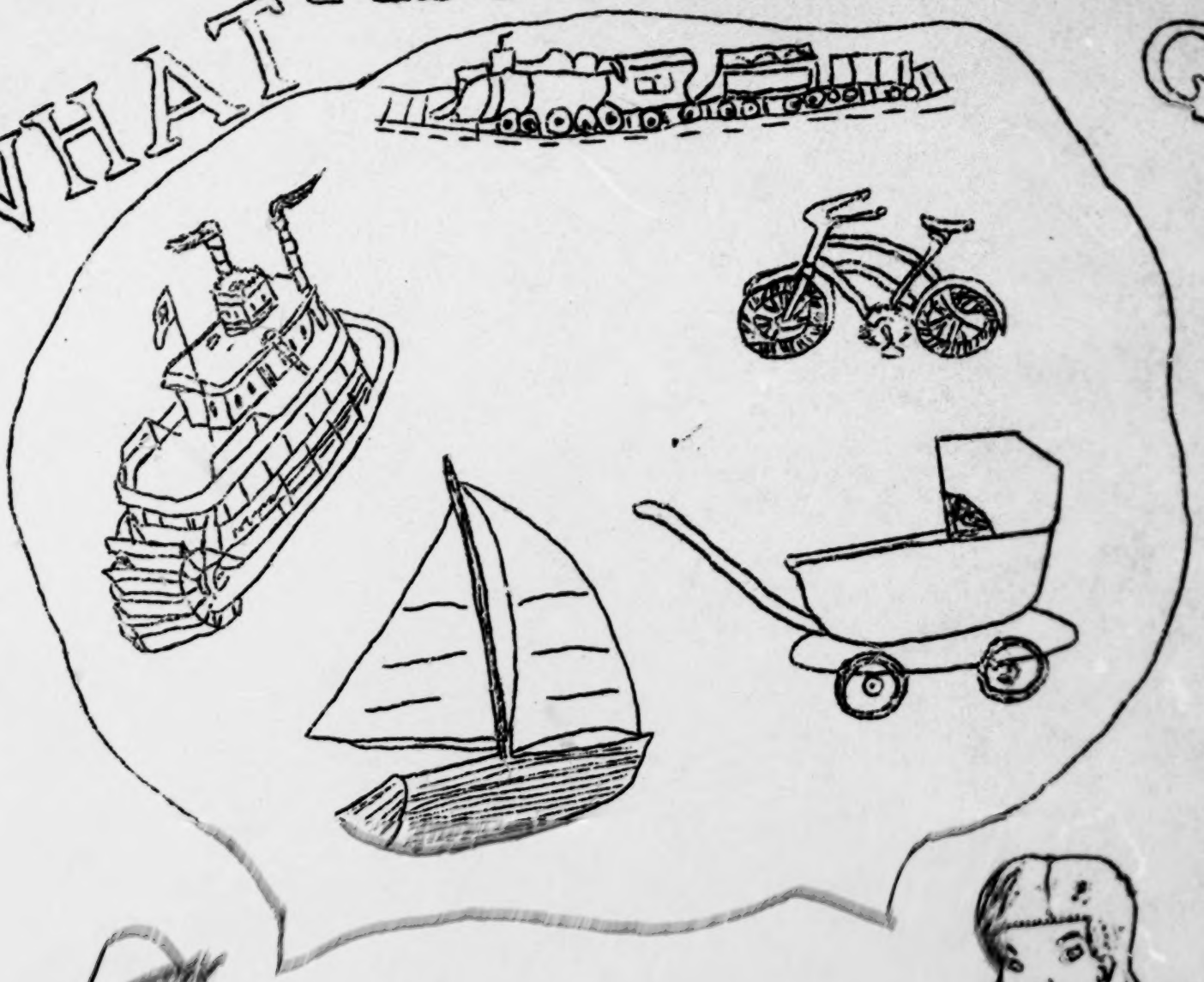
WHAT MAKES THINGS GO?



M O B I L I Z A T I O N F O R Y O U T H

CURRICULUM CENTER

271 EAST 4TH STREET

NEW YORK 9, NEW YORK

A L L R I G H T S R E S E R V E D

1964

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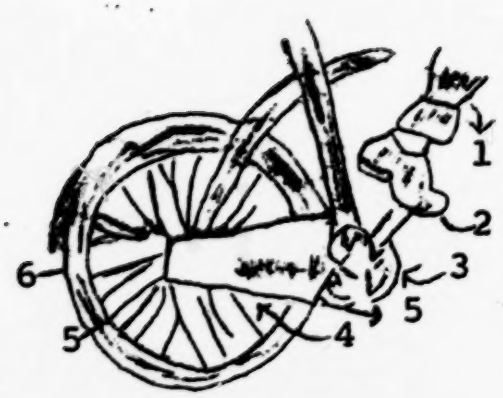
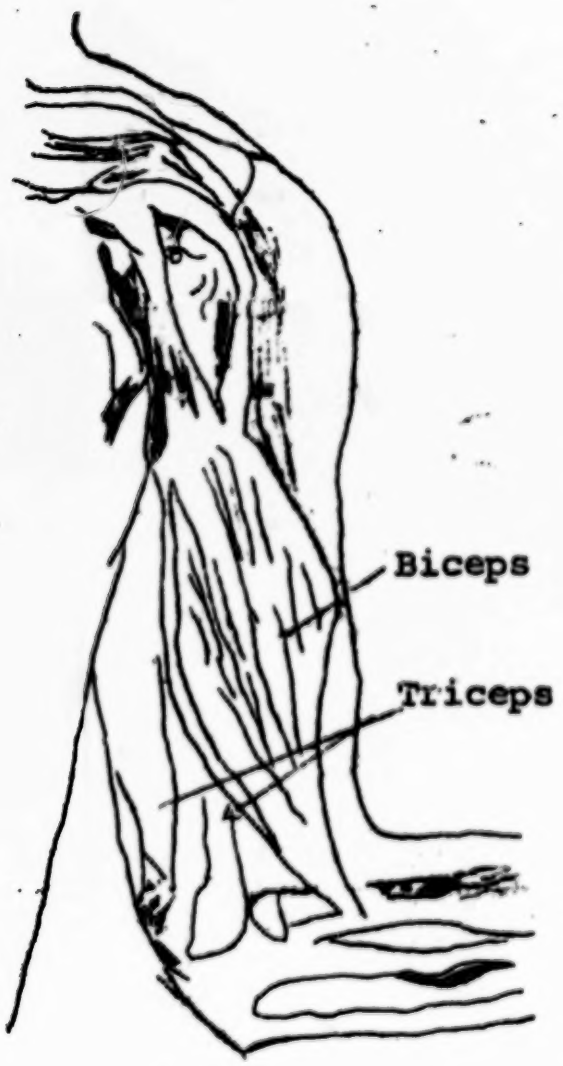
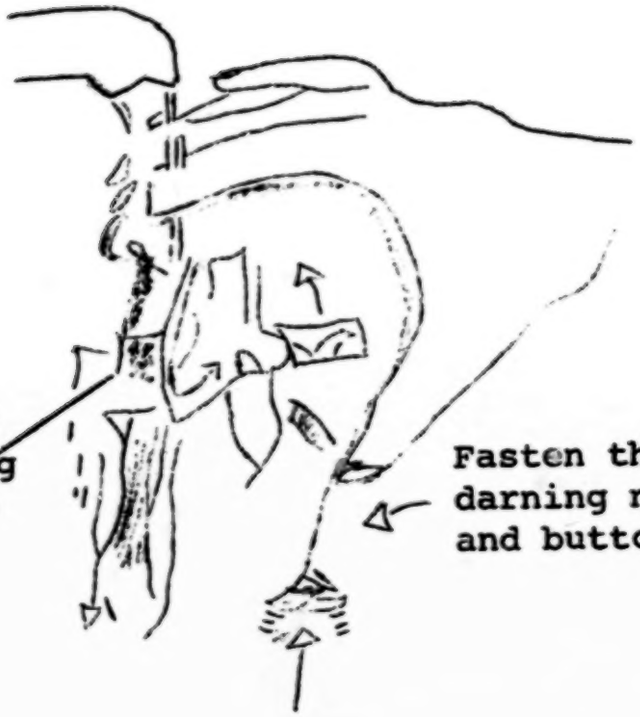
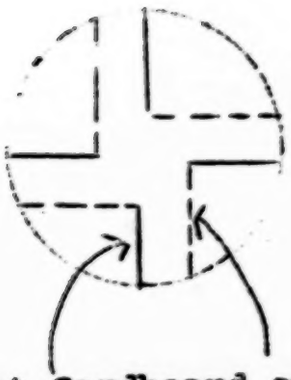
1. MUSCLES MAKE IT GO





What can make your bicycle go? Did you watch the legs move up and down? The leg (1) pushed the pedals (2). The pedals turned a wheel that seemed to have teeth around it. Such a wheel is called a gear (3). This gear wheel turned the chain (4). The chain turned the small gear wheel (5). The small gear wheel made the back wheel turn (6). As the back wheel turned, the bicycle moved ahead. The force (push) to make your bicycle go came from the push of legs. Do you know what made the leg push up and down? Muscles did it. Muscles in your arms and legs help you to do work.





Cut Cardboard on solid lines. Fold on dotted lines.

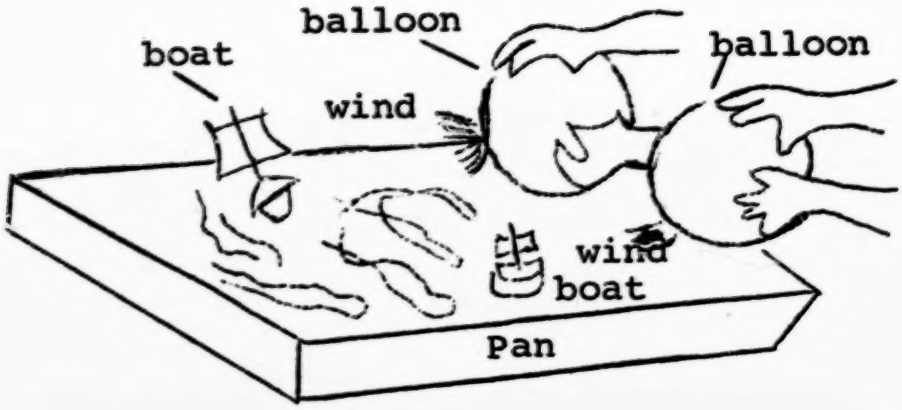
We made a model of a water wheel. How can a water wheel be used to do some work? To show how a water wheel can be used to do work, we did these things:

1. We made a water wheel. After that we tied a small weight, a button, to one end of a piece of string. We tied the other end of the string to the long turning part of the water wheel called an axle. This axle was our pencil sharpened at both ends.

2. We held the water wheel under running water. We saw the water wheel turn. As the water wheel turned, the string tied itself around the axle. At the very same time the string lifted the button.

Running water was the power that did the work. This push of water is called water power.

5. WIND MAKES IT GO

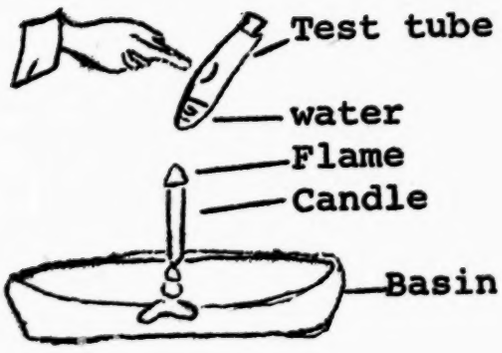


Wind from balloons moves these boats

We had an interesting boat race with make-believe boats. One boat had a sail. The other did not. The one with the sail won the race. We made our own wind by blowing on each boat.

From this race we learned that the wind is moving air. The wind moves sail boats by pushing against their sails. The wind can be used to do work for us. We call this wind power.

4. STEAM MAKES IT GO

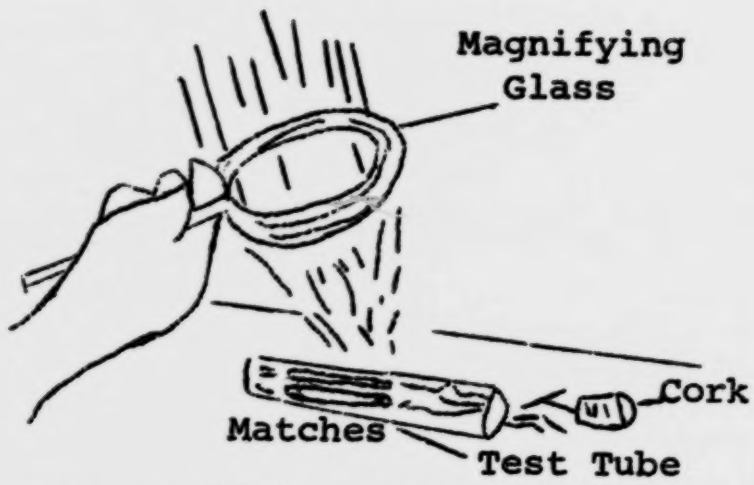


This time, steam was needed to make things go. A test tube was filled with a little water. The test tube was closed tightly with a cork. Water was changed into steam by carefully heating the test tube over a flame. Suddenly the cork flew off. Why did the cork fly off? It flew off because of the push of the steam. This push of steam is called "steam pressure". Steam pressure can do work.

5. FAST BURNING MAKES IT GO

:est tube and a cork stopper were used.
) matches were put inside the test tube.
nagnifying glass pulled a lot of light
gether into a hot spot. We held the
gnifying glass and the test tube so that
e light was focused on the matches. Sud-
nly the cork stopper flew out of the
st tube. How did this happen?

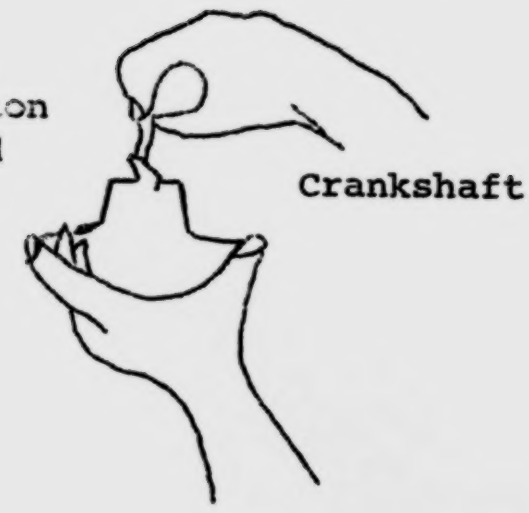
: quick burning of the matches let off
s and heat. A gas is something like air.
the same time, the air near the matches
s made hot. The hot air and gas began
gainst the sides of the test tube.
was the hot air and gas that pushed the
k out of the test tube. Why did the
k pop out?



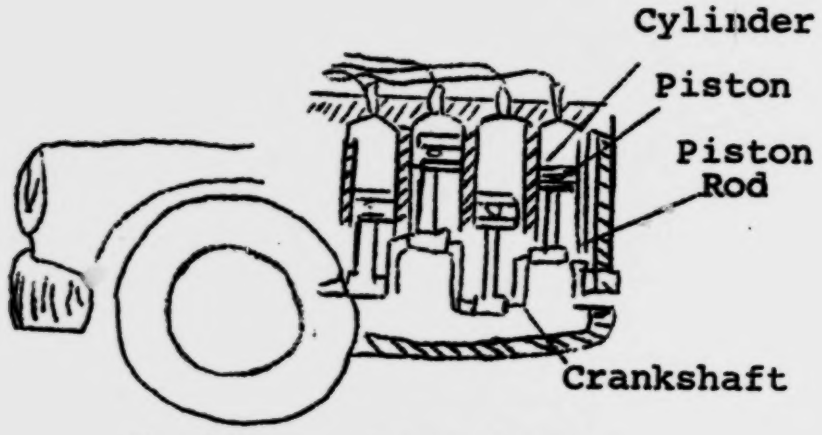
Sun's rays light matches; heated gases expand - cork pops.

.....

Hand served as piston



Up and down movement becomes round and round movement.

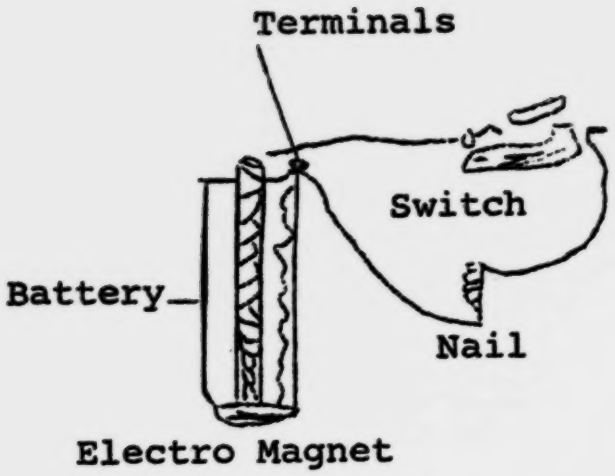


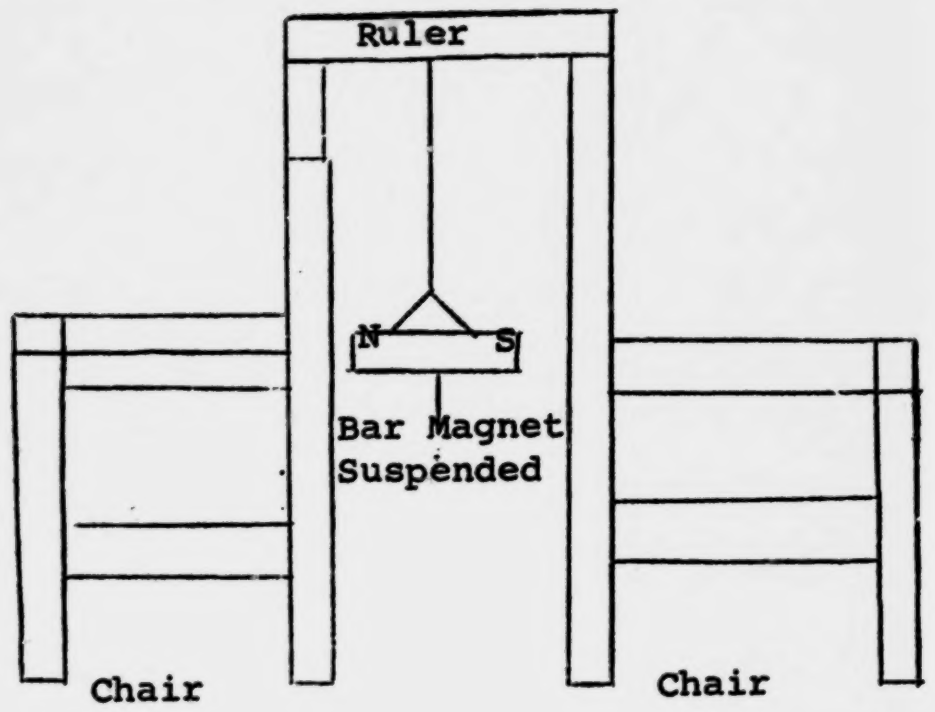
Insides of Car Engine

Just as we burned matches in the test tube, so we burn gasoline in a car engine. When gasoline is burned it turns into gas. This gas causes pistons im the engine to move up and down. Why do the pistons move? When the pistons go up and down the crankshaft goes around and around. The crankshaft turns the wheels which makes the car go.

6. ELECTRICITY MAKES IT GO

We wondered about what was inside an electric motor. When we looked inside we saw turns of wire and other parts. The turns of wire were electric magnets called "electromagnets." These electromagnets became magnets only when electricity (electric energy) went through the turns of wire. To understand how the electric motor runs we worked with magnets.





We worked with two different kinds of magnets. One was an electric magnet called an "electromagnet" which we made. We used dry cells, covered bell wire, a large iron nail, a switch (which lets electricity pass through wires or stops it), and a few paper clips. With these things we made and tested our electromagnet. We also worked with two long magnets called bar magnets (magnets which are loner than they are wide.)

One bar magnet was hung by a string. The other bar magnet and electromagnet pushed and pulled the hanging bar magnet around and around. This was done by having the ends of the magnet brought close to one another without touching. We also made the bar magnet turn round and round without moving the electromagnet. We did this by turning the electricity on and off with the switch. Magnets or electromagnets make an electric motor turn by pushing or pulling one another at their ends.

WHAT WE HAVE LEARNED

Muscles move bones in our body. The muscles move our bones which move our legs and other parts of our body.

Running water can turn wheels called water wheels. As we have seen, water wheels can do work.

The wind can be used to do work for us. The wind helps move boats by pushing against their sails.

Steam is made from water that has been heated. Steam has a push called steam pressure. Steam pressure can do work. For example, steam provides a steam engine's energy.

In a car engine, gasoline provides the energy. When gasoline burns, it gives off gases and heats the air near it. The heated gases and heated air take up more room and push parts in the car engine. These moving parts make the wheels turn.

An electric motor can make things go. An electric motor turns because of the pushing or pulling of the electromagnets in it.

SOME FACTS ABOUT ENERGY

The story of energy is an interesting one. This story begins in the time when the cave man lived on earth. At that time, many years ago, the cave man used his muscles only for the work that had to be done. Later he needed stronger kinds of energy, stronger than muscle energy. This led man to use animal energy. Man found that the stronger muscles of animals could help him do more difficult work. The cave man also made such tools as hammers, knives and axes, to add to the energy given by his muscles.

Man wanted to make his life easier. As time went on, he began using more and better kinds of energy to move his many tools and machines. He saw that wind and water were useful kinds of energy. The energy of moving water makes water wheels turn. Water wheels can be used to do work. Water wheels were first used as water hoists to lift things. The energy of the wind helped man drive his sail boats and windmills. Windmills used the wind to grind grain.

Then man learned to use steam in steam engines. Steam engines drive man's ships and locomotives. In time another kind of energy was discovered — the energy of gasoline in a gasoline engine.

Where does the automobile get its energy? The gasoline used in the car engine gives the car its energy.

Man needed still greater energy. He found out about electricity. Electricity is now used to run electric motors. Electric motors are found in fans, trains, belts, toys and many other things that make life easier for man.

The atom is man's newest kind of energy. The atom is the most powerful kind of energy man has discovered. Atomic energy is now used in ships and submarines.

We now live in an age of energy. Energy can be used to help man.

JUAN BOBO LEARNS ABOUT ENERGY

My name is Juan Bobo. I am an eleven year old boy. I live on the Lower East Side. I go to school there. I am in the fifth grade. I like to make things with my hands. I like to read books and look at pictures about science. I like to see how things work.

For my birthday, which comes on Christmas Day, I received many gifts from my mother and father. Under my Christmas tree, there was a bicycle, a toy water wheel, a sail boat, a toy steam engine, a toy electric train. I was a very happy boy with my new gifts. I wanted to see how they worked.

I took my new bicycle into the street. I began to ride it. I was having fun. I saw how my legs pushed the pedals. The pedals began to turn the large wheels. The wheels turned the chain. The chain turned the small wheel. This made the bicycle go. I saw I was using my muscles to make the bicycle go.

I brought my bicycle to my house. I began to play with my water wheel. I put my water wheel in my bath tub. I put the water wheel under the water fa ucet. I saw the running water turn the wheel. I saw the wheel wind up a string as the string raised a pail holding water. It did work for me. I learned that water wheels are turned by the energy of moving water.

Then, I took my sailboat and put it into the bath tub. I filled the tub with water. I made a wind by blowing with my mouth. I blew on the sail boat. I saw the wind help move my sail boat by pushing the sails.

Did you know that long ago man learned how to use the energy of the wind? He put up sails so that wind would drive his boats. I learned that wind energy can be used by man. Wind moves boats by pushing their sails.

JUAN BOBO LEARNS ABOUT ENERGY (CONT'D)

The next day, I played with my other toys. I wanted to see what made them go. I saw water being heated to steam in the steam engine. The steam had a great pushing force. This energy made the engine go by turning the wheels.

I also became interested in the way the wheels of my electric train turned. I took my electric train apart. Guess what I found inside? I found an electric motor. I saw how the electric motor turns the wheels of the electric train or locomotive.

I learned all about the different kinds of energy that make my toys go. I had fun. This was the best Christmas I ever had.

CHECKING UP ON WHAT WE HAVE LEARNED

Fill in the blank spaces for 1 and 2.

1. The _____ of your legs makes your bicycle go.

2. _____ in our arms and legs help us to do work.

Answer questions 3-10.

3. How did the water wheel turn?

4. What is one kind of work that a water wheel can do?

5. What is the push of water called?

6. What is wind?

7. Why did the sail boat win the race against the other boat that had no sail?

8. How is steam made?

9. How can steam do work?

10. What do we call the push of steam?

Pick the correct word. Fill it in for 11.

11. _____ is burned inside of a car engine to make it go.
(Gasoline, Oil)

Answer questions 12-17

12. What does this very quick burning make?

13. How does this burning of gasoline make a car move?

14. Can you name two parts of an electric motor?

15. What makes an electromagnet work?

16. How do magnets or electromagnets make an electric motor turn?

17. In what ways are electric motors used?

WORKING WITH WORDS

I. Use these new words for exercises a, b and c below:

turn

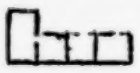
axle

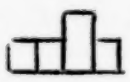
electricity

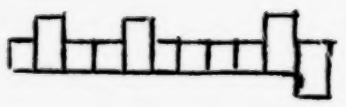
carefully

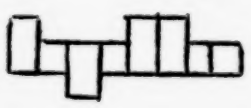
together

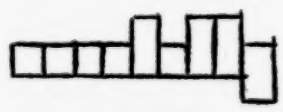
a. Fill in the boxes with the correct word.

1. We saw magnets  one another.

2. A wheel turns on an  .

3. In electric wires there is  .

4. The North pole of one magnet came  with the South Pole of another magnet.

5. To prevent anyone from getting hurt we worked  .

b. Write the word that has two small words in it._____

c. Write another word with the same ending as "turn."_____

II. Complete these sentences by giving the plural ending for each word:

1. I pushed one pedal.

   I pushed two _____.

2. I blew on a boat.

   I blew on two _____.

3. I used a switch.

   I used two _____.

III. Add either ed or ing to the word push in each of these sentences:

1. He push____ the pedals with his legs.

2. He is push____ the pedals with his legs.

3. She is now push____ the door.

WORKING WITH WORDS (CONT'D)

IV.. Mark the vowels correctly in the words below, either with a long vowel sound (mark –) or with a short vowel sound (mark ⌣). Cross out the silent letters. Ex.: māke hŏt

1. leg
2. use
3. light
4. hung
5. pencil

V. Write another word which has the same meaning or almost the same meaning for each of the following words.

1. force
2. hoist
3. each
4. flame
5. poles

VI. Write a word which has the opposite meaning for each of the following words.

1. push
2. small
3. won
4. bottom
5. few

WORKING WITH WORDS (CONT'D)

VII. Divide your dictionary into the 4 parts shown below.

Part 1. is for words beginning with letters a to g.

Part 2. is for words beginning with letters h to n.

Part 3. is for words beginning with letters o to t.

Part 4. is for words beginning with letters u to z.

Put the following words in one of the 4 parts shown above. The first one is done for you.

1. move Part 2
2. know _____
3. piece _____
4. itself _____
5. own _____
6. safe _____
7. pressure _____
8. electromagnet _____

SOME WORDS WE NEED TO KNOW

A

atom - smallest particle that makes up an element.

B

balloon - a round rubber bag with a small opening that can be blown up with air or gas.

biceps - a large muscle in the front of the upper arm.

bicycle - a device having two wheels, one behind the other, for carrying and moving people.

burn - to be on fire.

C

circuit - path along which an electric current can flow.

concept - a general idea of a class of things having common characteristics.

crank - a part which turns a shaft by pushing or pulling it.

crankshaft - a shaft that is turned by a crank.

current - a movement or flow (as of electricity).

cylinder - a long round body that is usually hollow like the inside of a round can.

D

device - a tool or instrument to bring about a desired result.

diagram - a line or picture drawing for scientific purposes.

E

electricity - movement of electrons or power of electrons to move.

electromagnet - a piece of iron with a coil covered wire around it so that the iron becomes a magnet whenever electricity passes through it.

engine - a machine that uses fuel to do work of some kind.

SOME WORDS WE NEED TO KNOW (CONT'D)

E

experiment - to find out something by testing to see what happens.

explosion - a very rapid burning with a sudden loud noise.

F

fire - the flame of light and heat given off by burning.

focus - the point at which rays, as of light, or heat, or sound meet.

force - the push that makes things move.

G

gas - anything like air that is not solid or liquid.

gasoline - a liquid fuel that changes into a gas easily and which is used to run motors.

gear - a wheel with teeth all around its edge.

H

heat - to make hot. (verb)

hoist - a machine that lifts things.

hydroelectric - the making of electricity by water power.

I

illustration - a picture.

insulate - to separate from other things.

J
(none)

K
(none)

L
(none)

SOME WORDS WE NEED TO KNOW (CONT'D)

M

machine - a tool that makes work easier.

magnet - anything that attracts iron or steel.

magnetism - the power to attract iron or steel.

motion - moving from one place to another place.

motor - a machine that makes something move or turn.

muscle - body tissue that contracts.

N
(none)

O
(none)

P

piston - a round and usually solid plug that is shaped like a can and slides back and forth in a tube called a cylinder.

pole - an end opposite to another end.

pressure - a pushing or pressing.

problem - a question to be worked out or solved as in science.

Q
(none)

R

ray - a line of light or radiant energy.

rod - a straight thin stick of wood, metal, or anything.

rotate - to turn around one's own center as a wheel does.

SOME WORDS WE NEED TO KNOW (CONT'D)

S

shaft - a round rod that is used as an axle.

solve - to find the answer to a problem.

steam - a gas into which water changes when heated to more than 212° F.

switch - a device for either making, breaking, or changing the connections in an electric circuit.

T

tendon - a connecting part between a muscle and a bone.

tool - an instrument for doing work by hand.

transmit - to send.

transportation - carrying of things from place to place.

triceps - large muscle along the back of the upper arm.

turbine - a wheel with blades, which are turned by the force of steam, water, air, or burning gases.

U
(none)

V
(none)

W

wind - moving air.

X
(none)

Y
(none)

Z
(none)